1991-2020 U.S. Climate Normals

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Conventional Climate Normals: standard 30-year averages and statistics of weather observations

- From Latin normãlis, “made according to a carpenter’s square”

- Putting today’s weather in proper context
- understanding today’s climate

...THE ASHEVILLE NC CLIMATE SUMMARY FOR NOVEMBER 11 2019...

CLIMATE NORMAL PERIOD 1981 TO 2010
CLIMATE RECORD PERIOD 1869 TO 2019

WEATHER ITEM	OBSERVED VALUE	TIME (LST)	RECORD VALUE	YEAR	NORMAL VALUE	DEPARTURE FROM NORMAL	LAST YEAR
TEMPERATURE (F)							
YESTERDAY							
MAXIMUM	67	308 PM	75	1949	61	6	49
MINIMUM	35	733 AM	18	1973 1957	37	-2	24
AVERAGE	51				49	2	37
PRECIPITATION (IN)							
YESTERDAY	0.00		1.87	2009	0.10	-0.10	T
MONTH TO DATE	0.12				1.17	-1.05	1.98
SINCE SEP 1	8.80				7.89	0.91	11.83
SINCE JAN 1	50.51				39.50	11.01	63.43

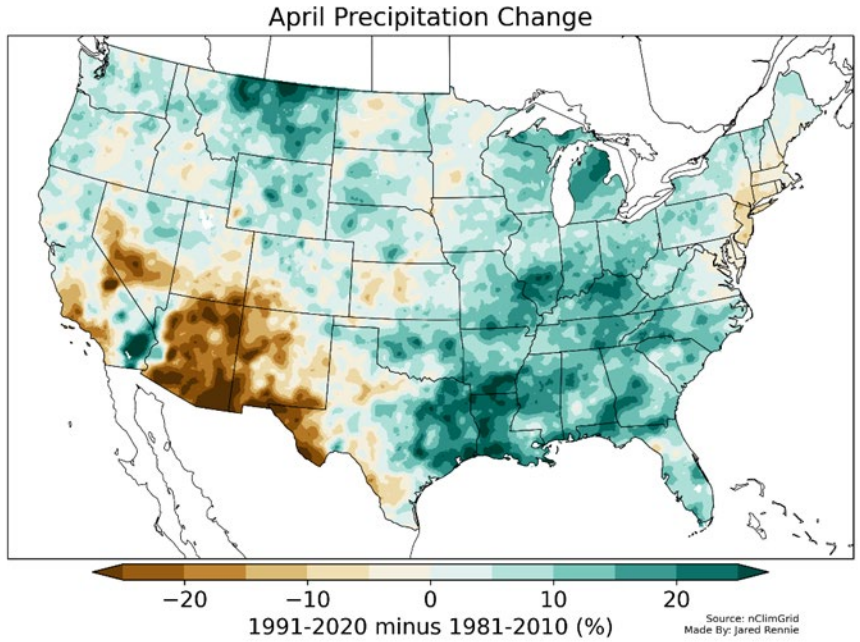
Key Takeaways

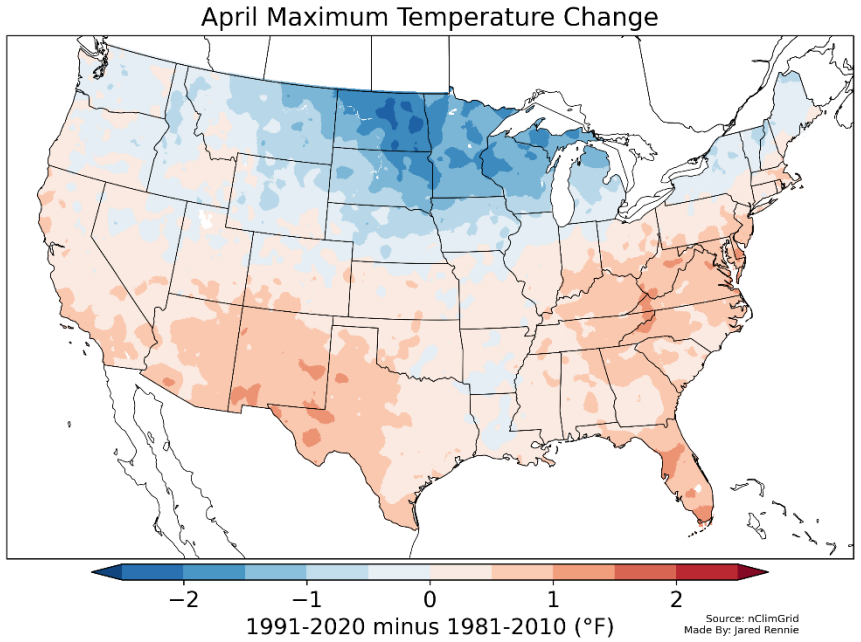
- Climate normals meet the needs of our user communities
- NOAA NWS measures weather and climate in its COOP and ASOS Networks and provides 90+% of the station data for normals; for the first time USDA Snow Telemetry (SNOTEL) and the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) stations will be included in precipitation normals
- NOAA NCEI is the source of official climate normals for station locations in the U.S.
- 30-yr normals are not simple averages
- **1991-2020 U.S. Climate Normals will be released 4 May 2021**

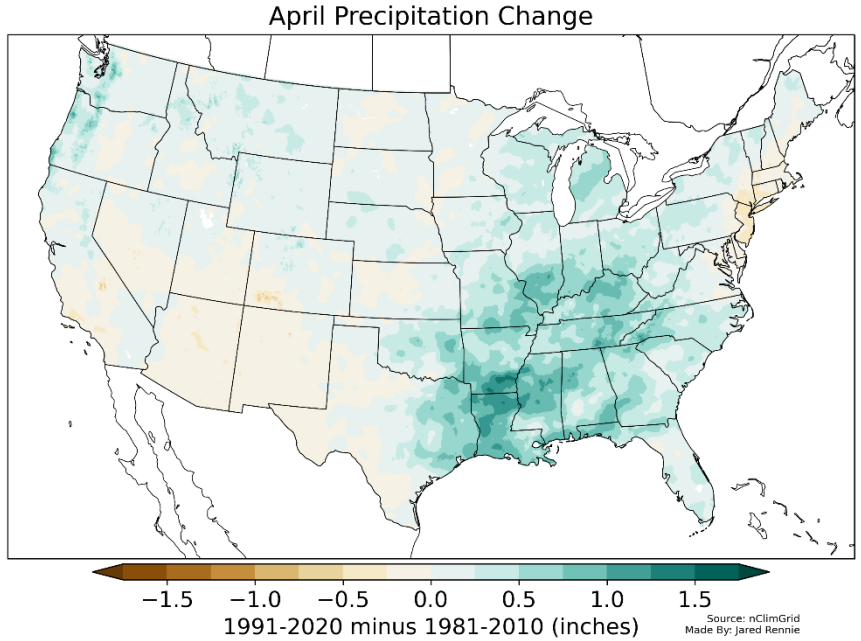
What do the New Normals Say?

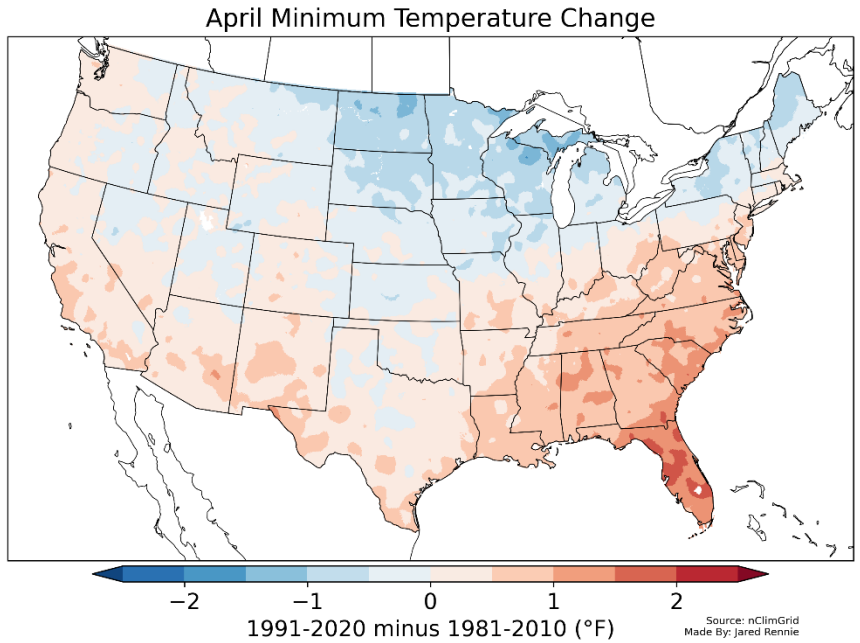
- There are now almost 15,000 stations with precipitation normals and more than 7,300 stations with temperature normals
- Warming from 1981-2010 to 1991-2020 is widespread but not ubiquitous across the conterminous U.S., either in geographic space or time of year, with recent cooling in the north central U.S.
- Precipitation changes from 1981-2010 to 1991-2020 also vary considerably on a month-to-month basis, but are generally wetter in the southeast and central U.S.

Example: April Changes New-Old Normals









National Weather Service Main Themes

- 30-year normals are shared in our Daily and Monthly Climate summaries for stations across the US.
  - Commonly used in local TV weather broadcasts, newspapers, and other media venues.

- The use of 30-year normals allows us to provide context for weather and extreme events on daily to annual time scales.
  - The average temperature during the February cold air outbreak in Dallas-Fort Worth on February 16 was 42 degrees below normal.
  - Commonly used in local news stories and shared via social media.

- NWS Climate Prediction Center (CPC) outlooks reference chances of above or below normal temperatures and precipitation relative to the 30-year normals.
  - Outlooks issued starting May 20 will reference the new set of 30-year averages.

NWS and Partners use the data for…

- Drought Assessment
  - Various drought indices assess conditions for the US National Drought Monitor by comparing differences between observed data and normal.
- Freeze Risk
  - Farmers and gardeners plan their production practices considering dates/risk of spring and fall freezes based on normal last spring and first fall freeze dates.
- Energy
  - Energy companies monitor Heating and Cooling Degree-days and comparisons to normal to assess energy usage.
- Snow
  - Local government can use average or normal snowfall for budget and operations planning. Mountain snowpack is critical for water resources.
- Travel
  - What is the weather like where I'm planning my vacation?

Where observations come from…

ASOS – Automated Surface Observing System

- Airport weather stations
- 900 NWS, FAA, and DoD locations
- Source for daily and monthly local climate observations
- Temperature, dew point, wind speed and direction, precipitation amount and type, ceiling, visibility
- Data primarily support airport operations and the aviation industry

Where observations come from…

Cooperative Observer Weather Program

- Established in 1890, currently 10,000 volunteers gathering observations at roughly 8100 weather stations nationally
- Daily maximum and minimum temperature, 24-hour precipitation, snowfall, snow depth
- Temperature accurate to 0.3°F
- Precipitation accurate to 0.01 inch
- NWS field offices (WFOs) maintain these weather sites and provide preliminary quality control of the data.

Conventional 30-Year Normals and New Supplemental 15-Year Normals

- First normals were developed in the mid-1930s, when most countries had collected only about 30 years of climate data: 1901-1930
- World Meteorological Organization requires member states to produce 30-year climate normals and provides guidelines

https://library.wmo.int/index.php?lvl=notice_display&id=20130

- Shorter-period normals, such as the new 15-year normals, are required by some sectors for applications that use normals to predict conditions in the near-term future
- The U.S. is replacing the current 1981-2010 normals with 1991-2020 normals and supplementing with new 2006-2020 normals

Included in the Normals

- Overview:
  - Annual, seasonal, monthly, daily, and hourly statistics
  - Averages, frequencies, terciles, quartiles, quintiles
  - Temperature, precipitation, snow, dew point, sea level pressure, clouds, wind

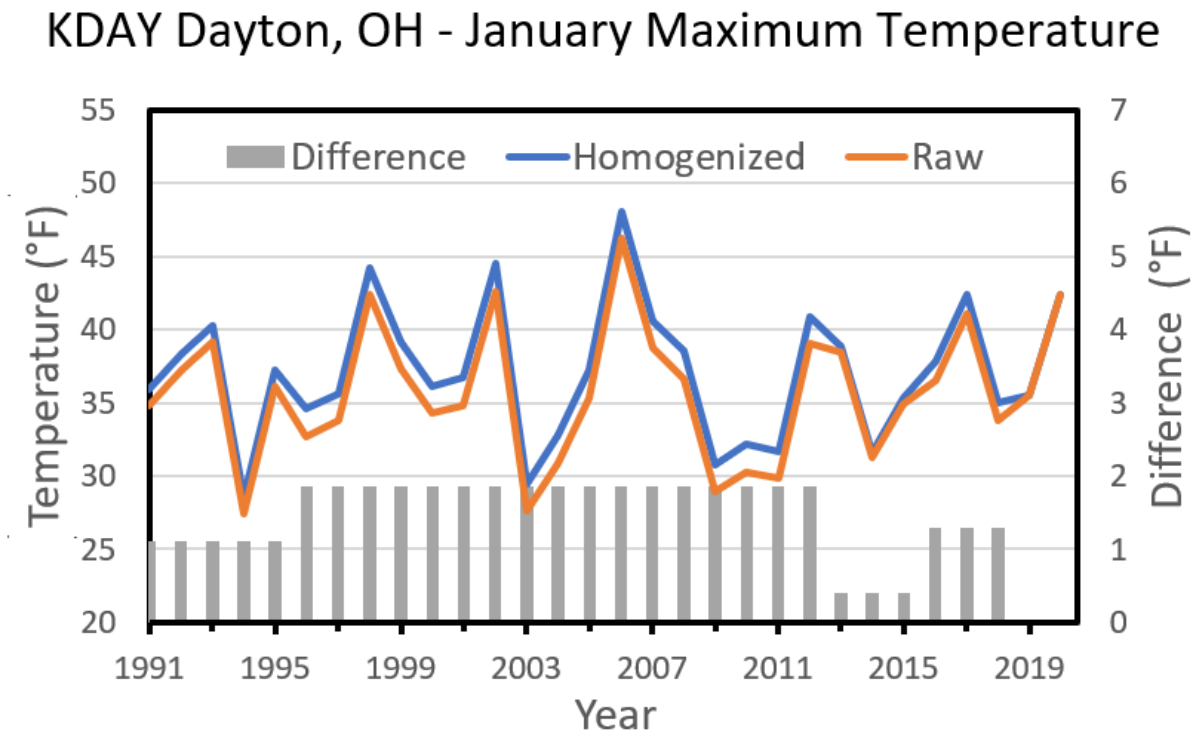
- Here are some examples of normals at a weather station:
  - Average January high temperature
  - Average annual precipitation
  - Third quartile of February snowfall (75% of Februaries are below this amount)
  - Average number of July days with a high temperature at or above 90°F
  - Average low temperature on April 20

Fundamental Normals – Not so Simple

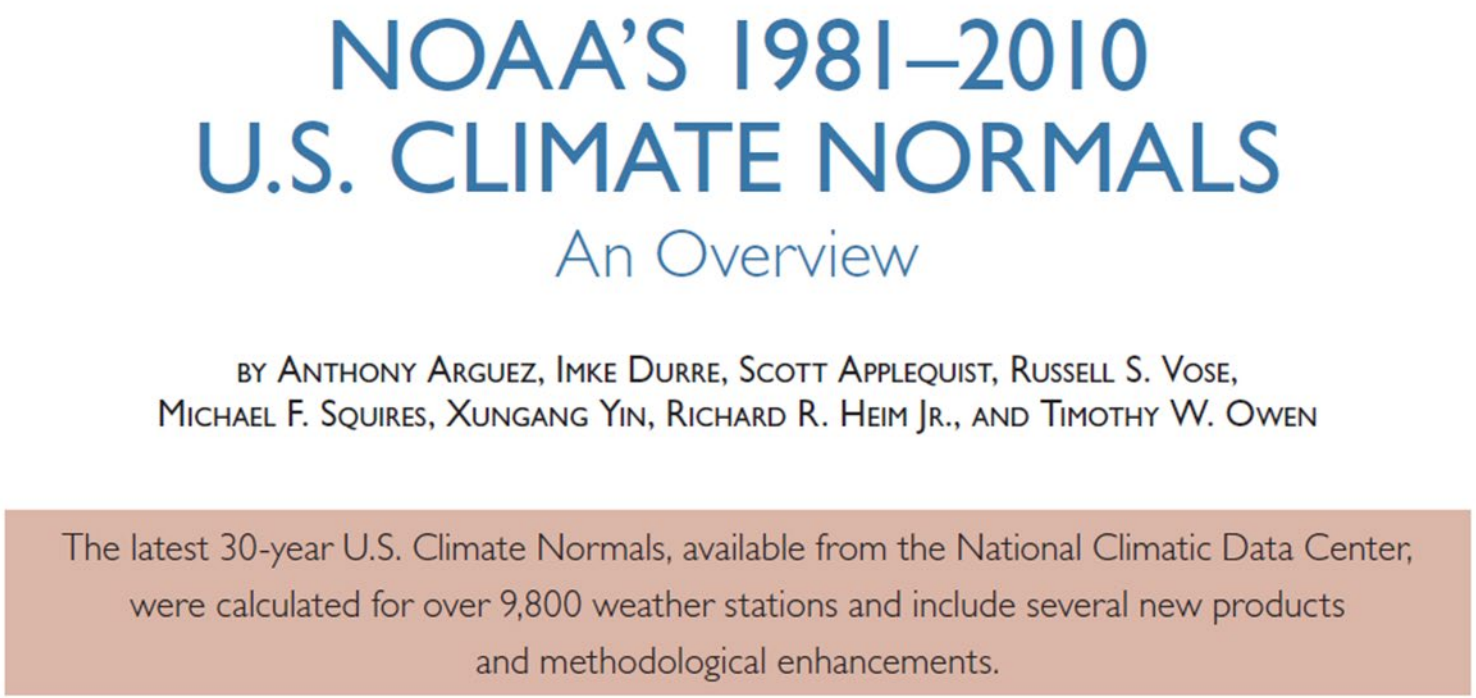
- Monthly temperature data were homogenized before the normals were calculated, accounting for station discontinuities

- Monthly precipitation data are not homogenized; they are required to be complete with all days available for monthly normals

Example: Dayton, OH Homogenized Time Series of Maximum Temperature Versus Raw Temperature, January 1991-2020



Theoretical Basis for U.S. Climate Normals Has Not Changed from Last Time


NOAA'S 1981–2010
U.S. CLIMATE NORMALS
An Overview

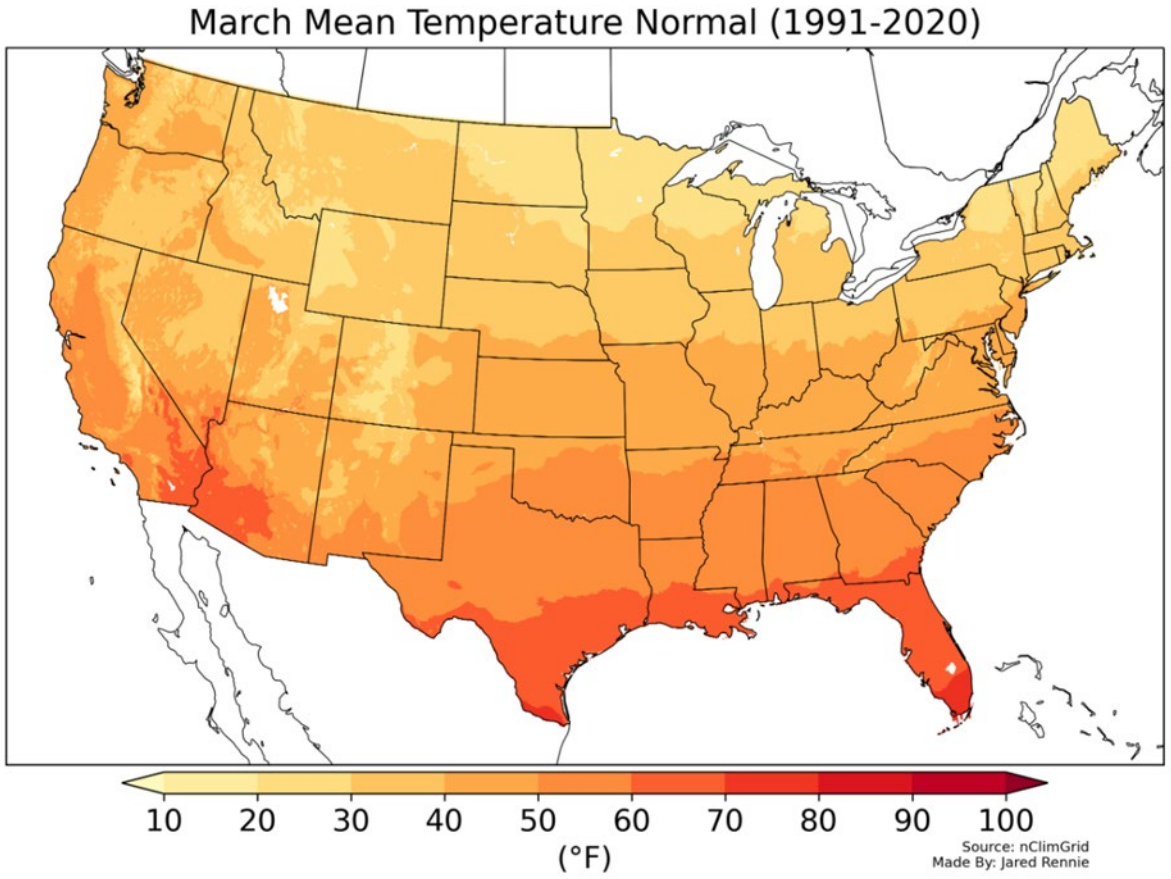
BY ANTHONY ARGUEZ, IMKE DURRE, SCOTT APPLEQUIST, RUSSELL S. VOSE, MICHAEL F. SQUIRES, XUNGANG YIN, RICHARD R. HEIM JR., AND TIMOTHY W. OWEN

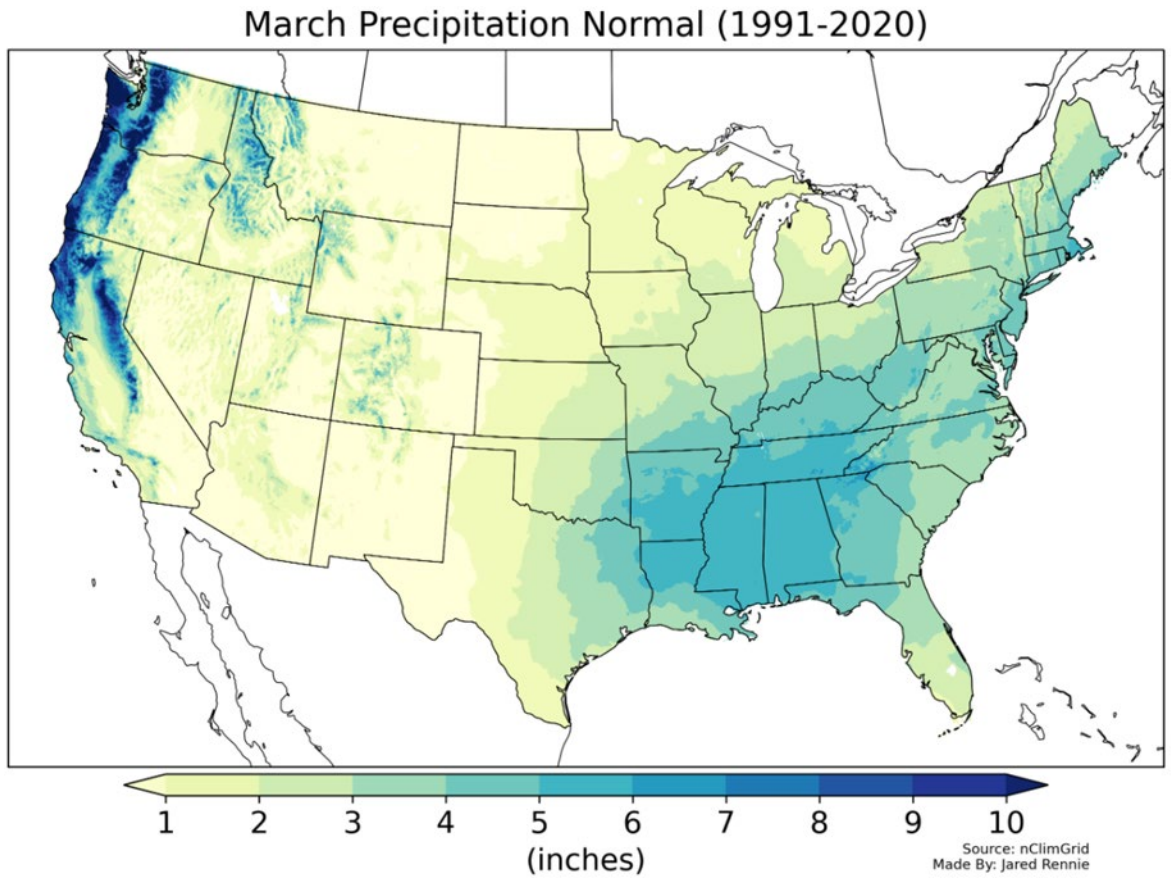
The latest 30-year U.S. Climate Normals, available from the National Climatic Data Center, were calculated for over 9,800 weather stations and include several new products and methodological enhancements.

Arguez et al. 2012. Bulletin of the American Meteorological Society, 93, 1687-1697.*https://doi.org/10.1175/BAMS-D-11-00197.1*
and more details are in the publications listed at the bottom of this web page.

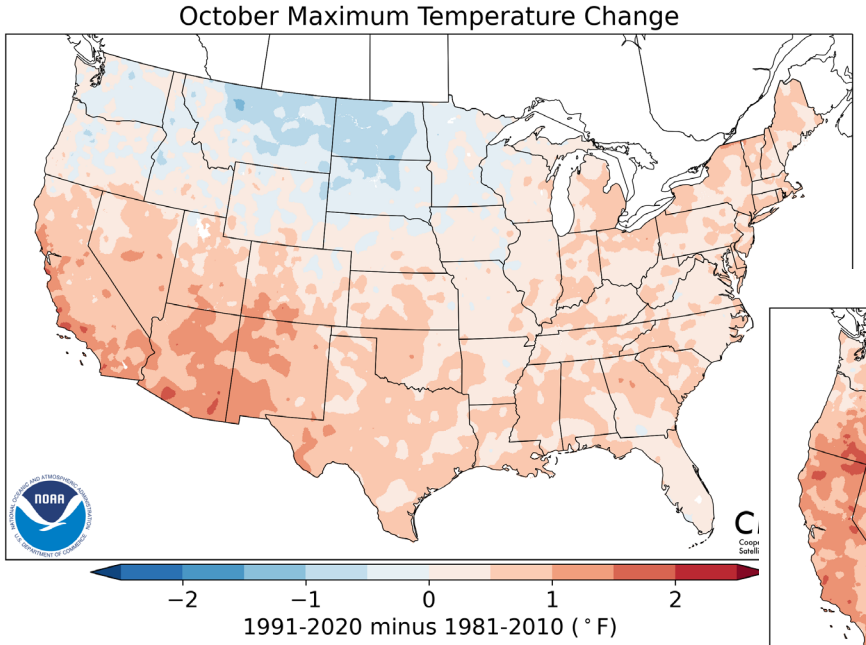
Gridded Normals: Another New Product

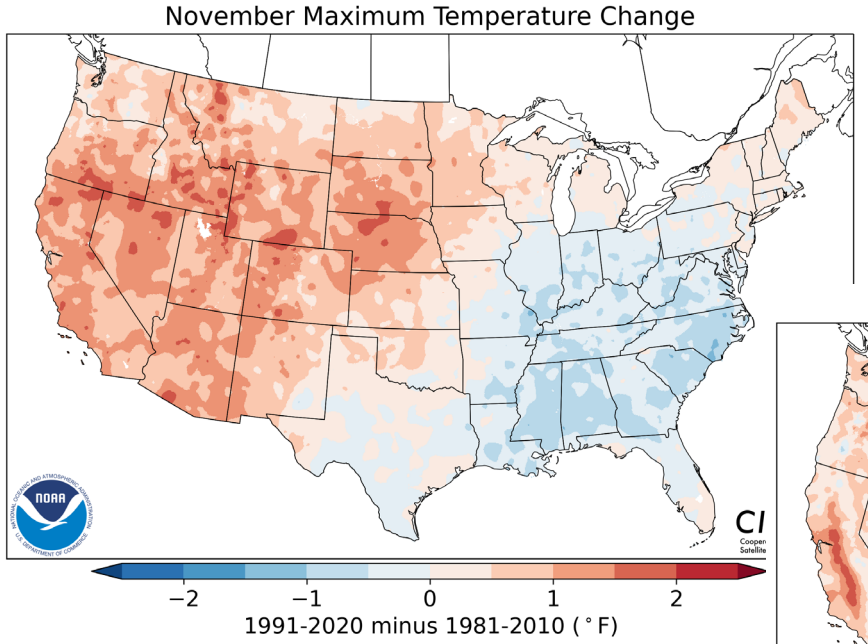
- Example: March Temperature and Precipitation Normals

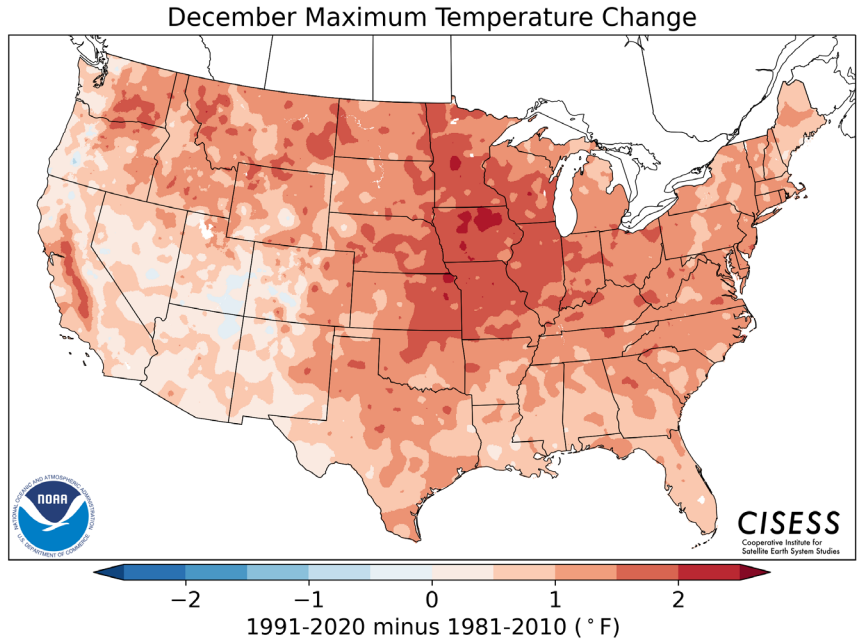




Difference in Normals Vary By Month





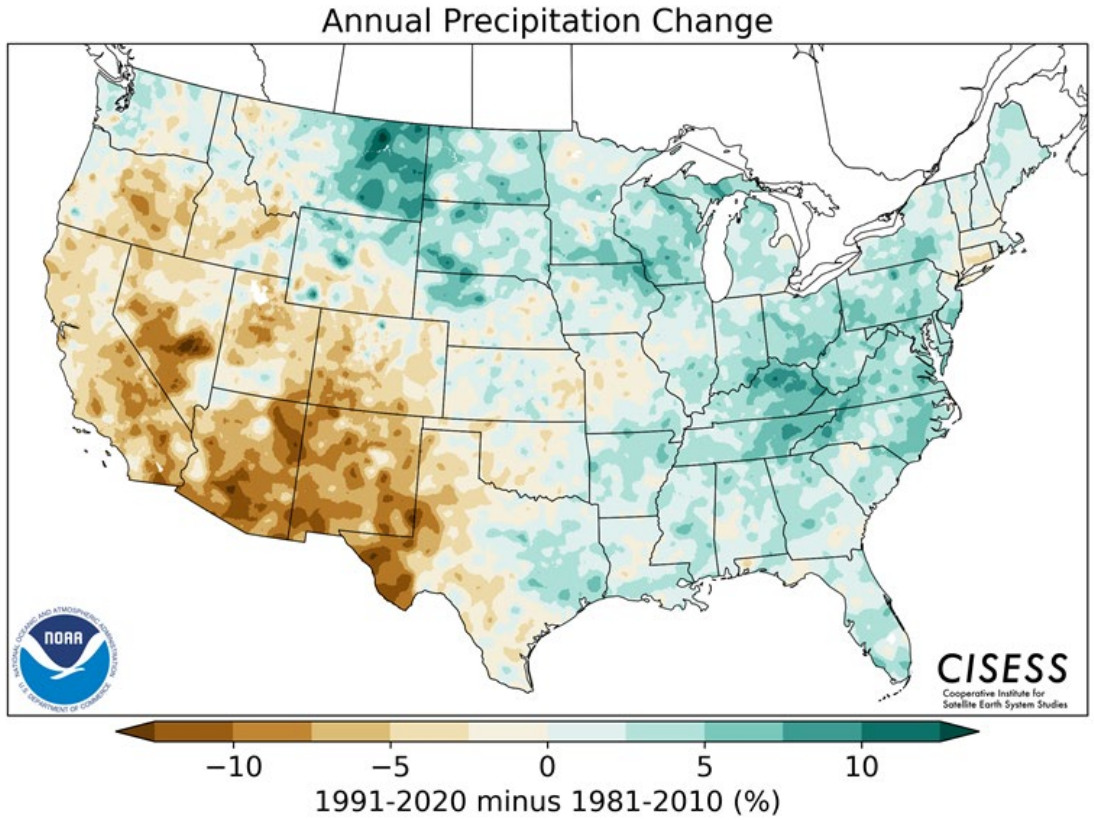


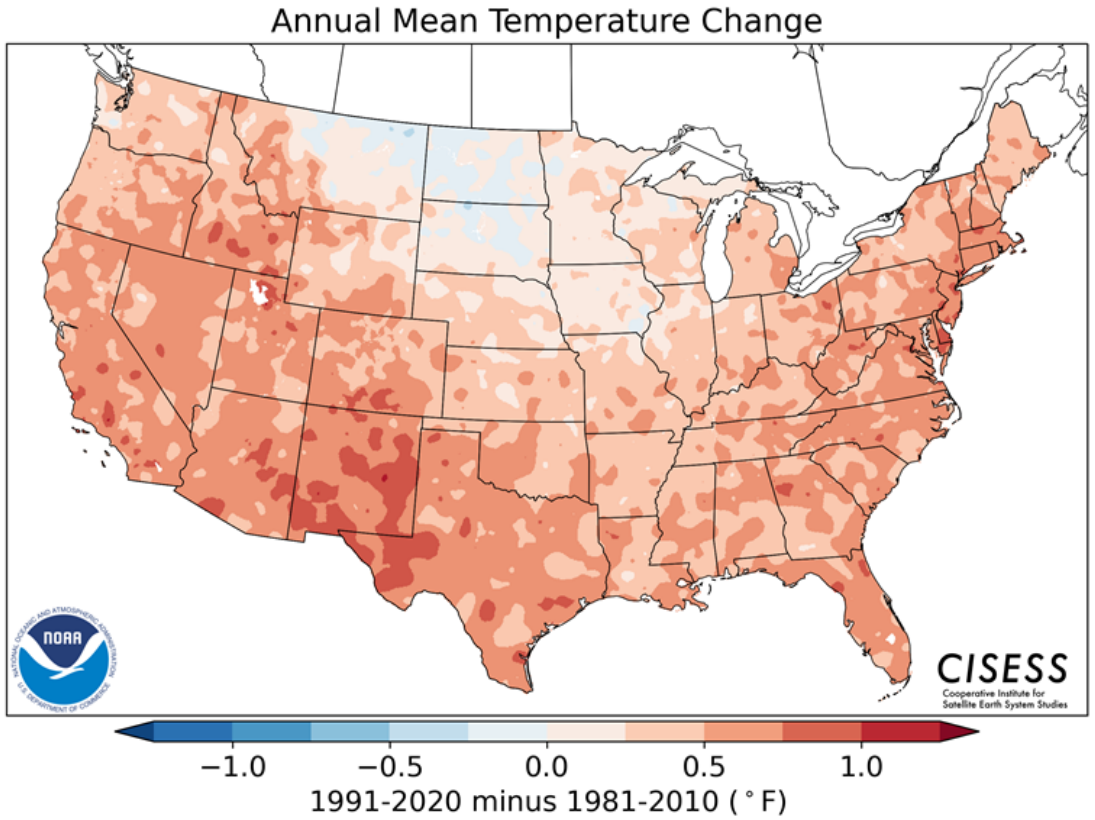
Big shifts in the Southeast normals from October to December

Annual Normals Changes At Some U.S. Cities

Location	ICAO	Precipitation	Change	Mean Temperature	Change
Asheville, NC	KAVL	49.59	4.02	57.4	1.5
Atlanta, GA	KFFC	49.30	-0.41	63.2	0.6
Boston, MA	KBOS	43.59	-0.18	52.0	0.5
Chicago, IL	KORD	37.86	0.97	51.4	1.5
Dallas-Fort Worth, TX	KDFW	37.01	0.87	66.6	0.3
Fargo, ND	KFAR	23.95	1.37	42.3	-0.1
Laramie, WY	KLAR	10.52	-0.40	41.5	0.5
Phoenix, AZ	KPHX	7.22	-0.81	75.6	0.5
Los Angeles, CA	KLAX	12.23	-0.59	63.6	1.0
Seattle, WA	KSEA	39.34	1.85	53.7	1.1
Fairbanks, AK	PFAI	11.67	0.86	28.4	0.7
Anchorage, AK	PANC	16.42	-0.16	37.7	0.6
Hilo, HI	PITO	120.39	-6.33	74.0	0.1
Honolulu, HI	PHNL	16.41	-0.69	78.1	0.4

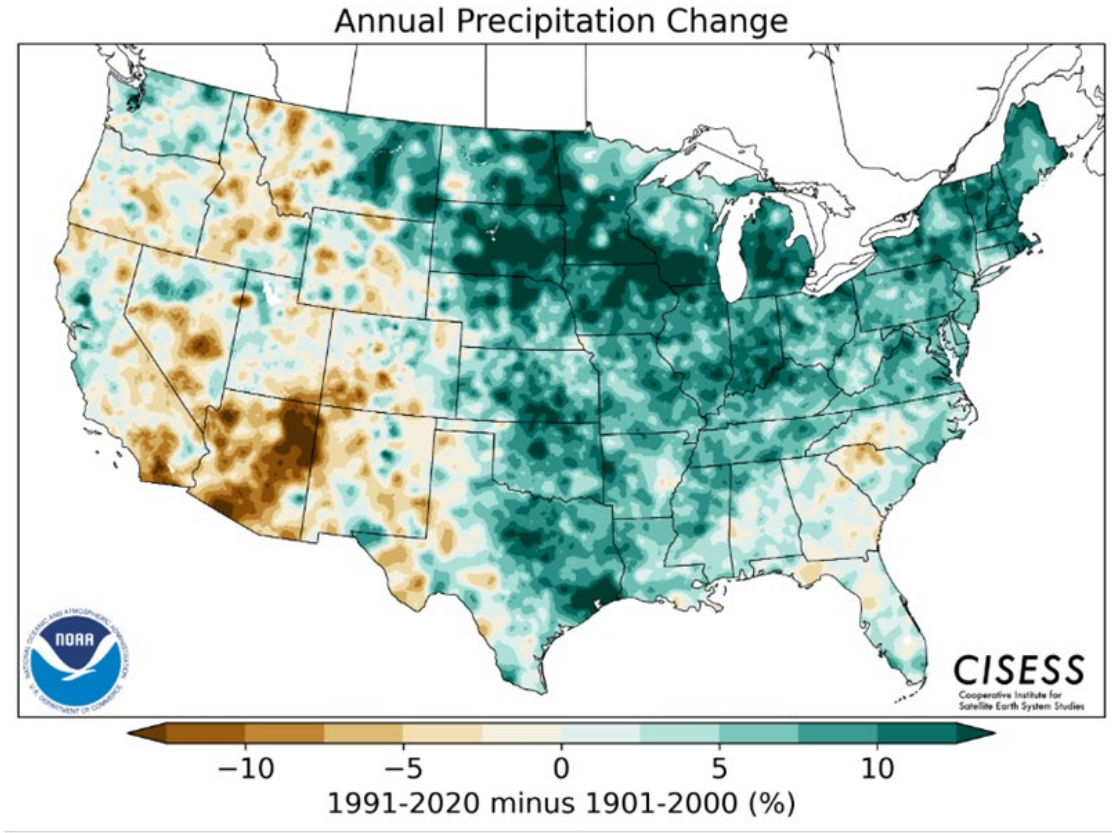
10-Year Annual Normals Change

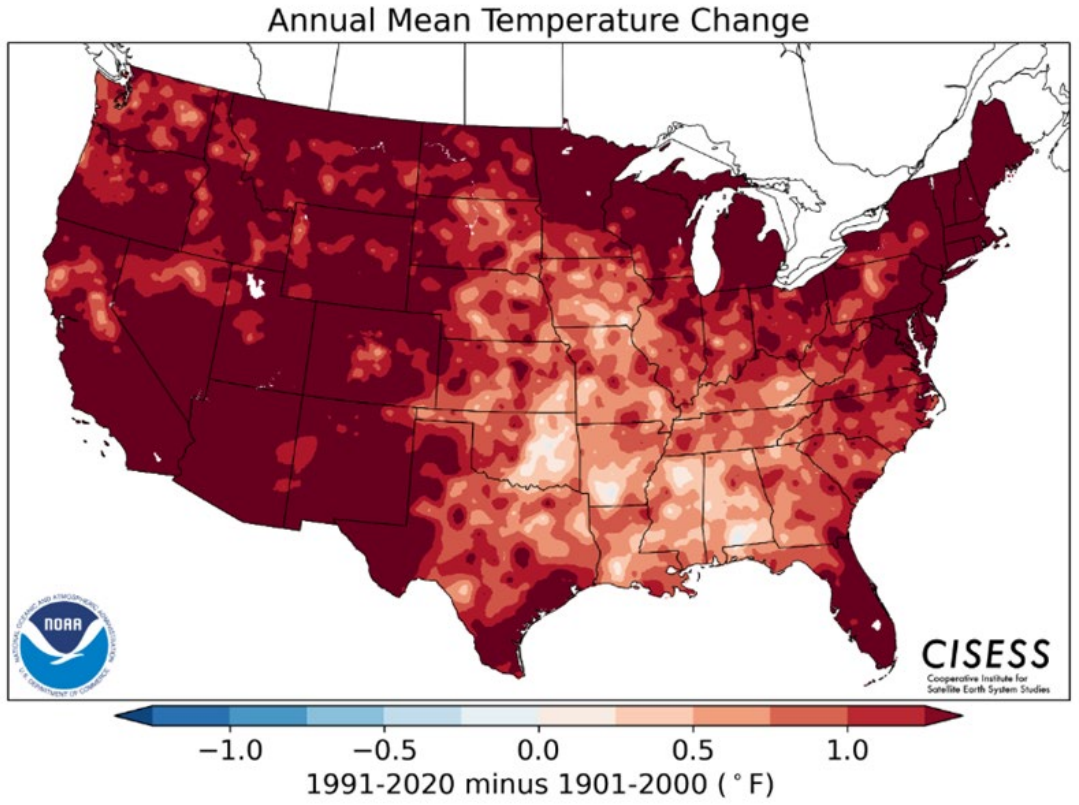




- Wetter in the central and eastern U.S., drier in the Southwest
- Warmer everywhere except the north central U.S.

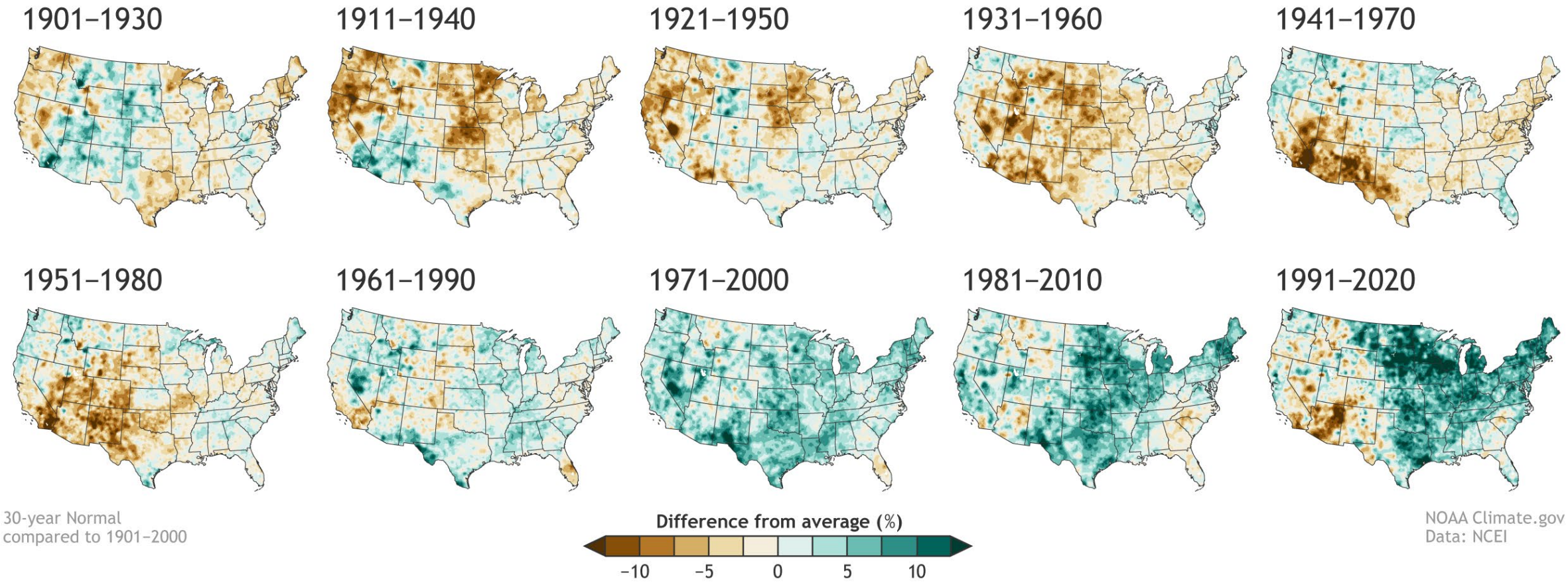
Comparing 1991-2020 to 1901-2000





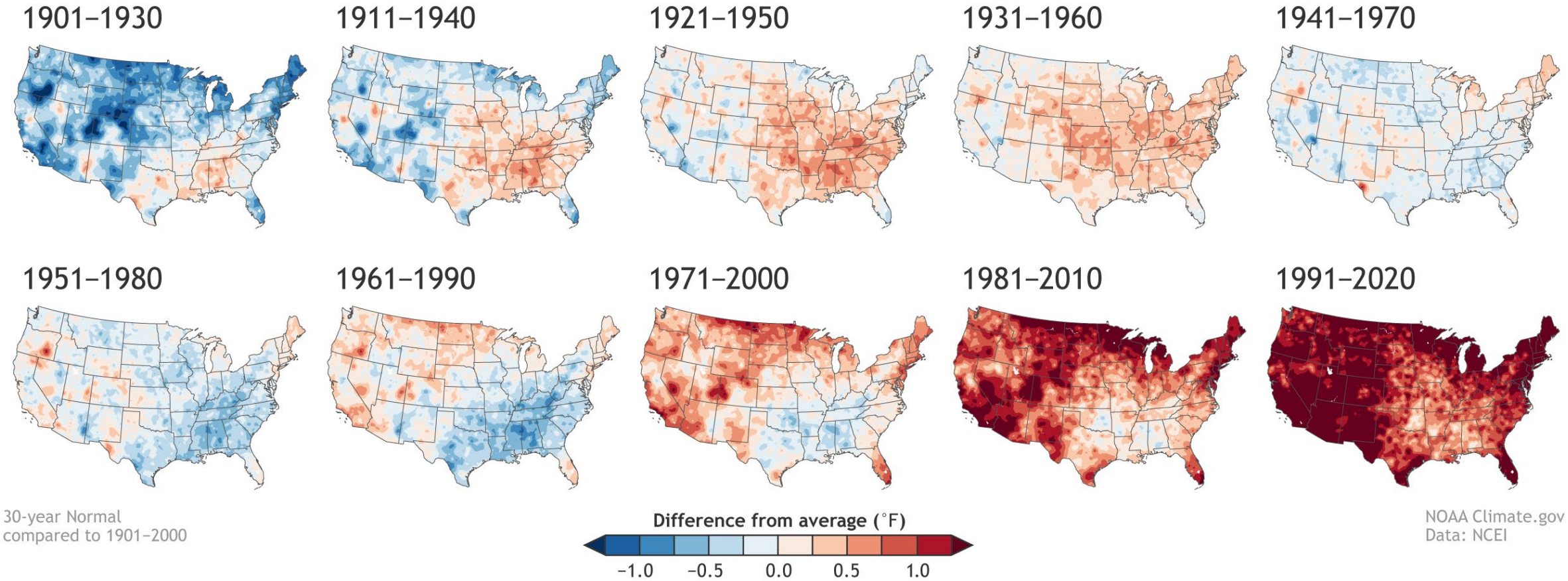
- Climate change is clearly seen in comparing the new normals to the Twentieth Century averages

Annual Precipitation Normals since 1901 compared to the 20th Century Average



- Climate change is coming into focus in recent normals.

Annual Temperature Normals since 1901 Compared to the 20th Century Average



https://www.climate.gov/news-features/understanding-climate/climate-change-and-1991-2020-us-climate-normals

For More Information

Current Normals Information:

https://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/climate-normals/1981-2010-normals-data

The access to old normals and FAQs and publication citations

Future Normals Links – Active May 4 2021

https://www.ncei.noaa.gov/products/climate-normals

The new normals Web page and single station access tool

https://www.ncei.noaa.gov/access/search/index

Link to our Common Access system – full set of new normals

Thanks!